

## Study of children with autism in the ability to see abstract objects

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Received: 18 December 2020

Revised: 24 January 2021

Accepted: 15 February 2021

### Abstract

The aim of current study is to compare the visual memory and concrete-abstract reasoning, in children having dyscalculia and normal children. For this reason, 25 normal students and 25 students having dyscalculia were measured by the use of tests such as Iranian Key-Math, sub-test of visual memory from Memory test (Wechsler), and similarities subscales from Intelligence test (Wechsler). Data analysis results showed that the mean of students without having dyscalculia comparing to the students having dyscalculia is higher in the scores of visual memory functions and the ability of concrete-abstract reasoning. Thus it is recommended to the teachers to take special courses of training about the methods of detecting the fundamental causes of dyscalculia in primary school students and methods of boosting memory in children, specially the visual memory and methods of increasing the ability of reasoning in children especially in the mathematics.

**Keywords:** Visual Memory, Concrete-Abstract Reasoning, Dyscalculia.

### How to cite the article:

E. Javani, Y. Ahmadi, *Study of children with autism in the ability to see abstract objects*, *J. Practical Soc. Psych.*, 2021; 2(1): 01-06,

### Introduction

Millions of children yearly enter the educational system for the first time, and they start the formal education and training, but a high percentage of this population do not manage to continue their education due to several reasons such as economic and family poverty, mental retardation, defects and physical and motor disabilities and etc. Despite the above mentioned causes, some of the students encounter problems due to the learning disorders in learning the lessons which ultimately result in academic failure and dropout, and along with these irreparable mental and economic damages occur to the child, family and the educational system (Abedi, 2007). Some children having learning disorders and they have difficulties in understanding mathematics, and despite using appropriate teaching methods these children could not progress in mathematics the same as their peers (Abdolkarim & Salimi, 2011).

Several fundamental factors have a role in the incidence and progression of dyscalculia in students, and only addressing curriculum

enrichment for these students without considering the causes of failure to learn and inability to understand them is in fact running the learning and educational programs without special aims, and it does not help their disorders to be solved. We cannot disregard the importance of memory and reasoning ability in the learning process. Most of the teachers and students' parents are aware of the students' learning disabilities and their problems but sometimes they overlook the required experience for the mentioned issues in teaching the abstract concepts and logical thinking and they emphasize on special aspects of subjective experiences and they ignore some of the simplest actions, conducting them requires complement of mental maturing. Disability of most of the novice kindergarten students in performing mathematical operations indicate this sad point that usually the required experiences for mathematics are neglected and valuable opportunities for reaching the logical thinking are lost (Rakhshan & Faryar, 2000).

Paying attention to the disorders and weaknesses of students in learning mathematics is very

important, because learning mathematics is considered as an icon for the mankind enabling him to think about phenomena quantitatively and recognize the correlations among them, and this has a long history in the life of mankind. Despite the fact that this learning usually starts before the formal education in school and it starts inexplicitly during transformation some of the children confront some difficulties from the beginning in understanding the concept of numbers and correlations related to them, while they may have good progress in other lessons. In fact, their performance in this area is not harmonized with their IQ and cognitive power. Students having dyscalculia are weak in problem solving. Such students are probably weak in reading the issue and understanding the required skills for solving it some others also have lack of analysis and reasoning skills and they will be confused confronting a mathematic problem. Abstraction of issue of the math problem and lack of existence of concrete objects and things that could be touched prevent from helping the students to solve the math problem and they cannot analyze (Karimi, 2010).

Although insufficiency affects the curriculum aspects of students' life at first place, it should be considered that other areas such as social and occupational areas are also somehow under this influence, and in most cases this negatively affects the mental health and the self-esteem. Moreover, association problems such as Attention Deficit Disorder, Hyperactivity, Depression and Neurological problems may also be along with this. Thus the child could be hyperactive, unresponsive and incompatible at the same time. Therefore the studied problem is that whether the visual memory and concrete-abstract reasoning ability in students having dyscalculia and normal students are different or not?

## **MATERIALS AND METHODS**

The current research methodology is scientific-comparative, and within this research the visual memory and concrete-abstract reasoning of children having dyscalculia and normal children are being compared.

### ***Participants***

The population includes all of the female elementary school students (3<sup>rd</sup> to 5<sup>th</sup> grade) with or without dyscalculia in Gorgan city during academic year 2012-2013. Participants include 50 students in two groups (including 25 normal students, and 25 students having disability in learning mathematics) and they were chosen by the use of cluster random sampling. For this purpose, two schools out of all of the normal elementary schools for girls in Gorgan city and

from each school in 3<sup>rd</sup>, 4<sup>th</sup> and 5<sup>th</sup> grades (each grade 1 class) were chosen, and teachers of each class were asked to identify students having disability in learning mathematics and then by the use of Iranian Key-Math, and Intelligence test (Wechsler) the samples being disable in learning mathematics were chosen. The normal students were also sampled and chosen from the same classes, and they were matched according to their age, educational levels, parents' educations and social-economic status.

### ***Measuring tools***

**1) Iranian Key-Math test:** This test is provided and standardized by Connolly (1998) and it is very applicable in detecting the students having disability in learning mathematics. Also it has been taken into consideration for determining the strengths and weaknesses of students in different mathematical fields, showing the effects of teaching mathematics in one operative program, evaluating the preparedness of students for starting teaching mathematics and offering adequate and accurate information to the teachers for planning and evaluating the educational programs. This test measures the knowledge and application of concepts and the important skills of mathematics in individuals ranging 5 to 22 years old. Its running time ranges between 30 to 50 minutes and due to the fact that this test does not need any reading abilities it is simply applicable for a wide range of students and it includes basic concepts and the mathematical operations and it is very applicable (Mohammad Esmaeil, 2002). The validity of this test in Iran is reported through the use of content validity, discriminant validity, and predictive validity of the calculation and its concurrent validity is between 0.55 to 0.67 and its reliability through the use of Cronbach's alpha is reported between 0.80 to 0.84 (Mohammad Esmaeil, 2002).

**2) Sub-test of visual memory from Wechsler's Memory Test (WMS):** The WMS is used as an objective scale for evaluating the memory. This test includes 7 sub-scales, personal awareness about the daily and personal issues, awareness about the time and place (orientation), mind control, logical memory, repetition of digits, visual memory and NOTE associations, and each sub-scale is assigned for measuring a component of memory. In a research Orkut (1995) reported this test reliability 0.67 based on the Cronbach's alpha. In order to achieve its validity, the factor analysis was used and within the factor analysis of this test through the use of M3 and ML method, 8 factors were detected, and based on the title and aim of the research only the sub-scale of visual memory is used. In this test 4 cards of geometrical shapes are given to the examinees for 10 seconds and they are

asked to draw the geometrical shapes by the use of their visual memory, and they are evaluated based on their quality, conformity, accuracy and completion of the drawings. The maximum score in all of the shapes for this test is 14.

**3) Similarities subscales from Wechsler's Intelligence Test (WISC-R):** Shahim (2008) states that Wechsler provided an intelligence scale for children in 1949 in order to evaluate their intelligence. This scale includes sub-tests that the items are put in each test according to their difficulties. The whole scale consists of 12 sub-tests divided to two groups based on the verbal or non-verbal features. 6 non-verbal sub-tests including pictures, respectively pictures, cubes, setting pieces, matching signs and mazes, and 6 verbal sub-tests include information, similarities, calculation, words, perception, and figures memory. To some extent the Wechsler's intelligence scale for children is an analysis and the scoring is conducted based on the success of the examinee. The reliability coefficient of the similarities sub-test in American children of age 7.5 and 10.5 was reported as 0.66 and 0.81 (Ganji, 2002). The Wechsler's revised intelligence scale for kids was standardized by Shahim in 2007 in order to evaluate the children's intelligence with the age range of 6 to 13, and it was translated, adapted and standardized by the use of a 1400 individual sample in order to use in Shiraz.

Re-evaluating reliability of the test was reported 0.44 to 0.94 (median 0.73) and its alpha reliability was reported 0.42 to 0.98 (median 0.69). Its concurrent validity through the use of correlation of scores with the scores of practical part of Wechsler's scale for preschool children (Wepsi) was 0.74. The correlation coefficients of verbal IQ, Practical Intelligence Quotient, and Total IQ were respectively 0.84, 0.76, and 0.80. The correlation coefficients of verbal IQ, Practical Intelligence Quotient, and Total IQ with the grade point average were respectively 0.52, 0.40, and 0.53 which were significant and they indicated a high correlation between the verbal IQ and Total IQ with the grade point average (Shahim, 2008).

In the current research in order to measure the concrete-abstract reasoning the similarities sub-scale were used, because one of the important aims of similarities sub-scale in Wechsler's test is evaluating the ability of concrete-abstract reasoning (Nazari et al., 2012).

#### Data analysis

In the current research the indicators of descriptive statistics (Mean, median, SD, variance, and charting) and inferential statistics (independent t-test) were used in order to describe, conclude and categorize the achieved data from the sample.

#### RESULTS

**Table 1:** Comparing the scores of visual memory functions in groups.

Groups	No.	Mean	SD	df	t	Sig.
Without Dyscalculia	25	12.08	1.656	48	4.748	0.000
With Dyscalculia	25	9.68	1.909			

As it is observable in table data, the scores of visual memory functions in the mean of students without dyscalculia is more than students with dyscalculia ( $t=4.748$ ,  $p \leq 0.05$ ), which means that children having dyscalculia have weaker performance in the Wechsler's visual memory function test. In other

words, a significant difference exists between the two groups of children without dyscalculia and children with dyscalculia in the component of visual memory.

**Table 2:** Comparing the scores of ability of concrete-abstract reasoning in groups.

Groups	No.	Mean	SD	df	t	Sig.
Without Dyscalculia	25	12.44	2.888	48	3.377	0.001
With Dyscalculia	25	10.04	2.071			

As it is indicated in table 2 data, the scores of ability of concrete-abstract reasoning in the mean of students without dyscalculia is more than the students with dyscalculia ( $t=3.377$ ,  $p \leq 0.05$ ), which means that children having dyscalculia have weaker performance in similarities sub-test of Wechsler's Intelligence test. In other words, a significant difference exists between two groups of

children with and without dyscalculia in the component of concrete-abstract reasoning.

#### DISCUSSION AND CONCLUSION

This research has been conducted with the aim of comparing the performance of children having dyscalculia and normal children in the visual memory function and ability of concrete-abstract reasoning. Based on the achieved results for the

research 1<sup>st</sup> hypothesis indicating the comparison between the performance of children having dyscalculia and normal children in visual memory functions, as it was expected, a significant difference existed between the mean of two groups, which means that children having dyscalculia have weaker performance in this function, this group make more mistakes in drawing the pictures related to the visual memory (from Wechsler's memory test), and these results are consistent with the results of Janeh et al (2011), Abedi and Aghababaei (2010), Mazzocco and Hanich (2010). For explaining this result it could be said that problems in drawing the geometrical shapes of Wechsler's memory test could be the result of disorder in visual memory function. Kajbaf and et al (2010) stated that a significant difference exists between the memory profile of these children and the normal children. Also the children having dyscalculia had weak performance in NOTE academic assignments, and daily reminders and they did not effectively use the recovery strategies.

Ramezani and Beshavar 2002 (Quoted by Janeh and et al., 2011) showed that children with learning disorders cannot conduct mental maintenance tests of numbers and students with dyscalculia in 4<sup>th</sup> and 5<sup>th</sup> grades showed delay in rowing, classifying and mental maintenance of figures. The overall result is that maybe the weakness in performance of these students in conducting geometrical exercises and exercises which need remembering and spatial visualizing of geometrical shapes and remembering math formulas is due to the weakness and disorder in their visual memory functions.

Based on the research results about the 2<sup>nd</sup> hypothesis indicating the comparison between the performance of children with dyscalculia and normal children in concrete-abstract reasoning, as it was expected, a significant difference existed between the two groups, which means that children with dyscalculia had weaker performance in reasoning ability, and this group gained lower scores in responding to the questions of Wechsler's test similarities sub-test. In order to explain this conclusion in a research Janeh et al (2011) showed that executive functions of reasoning in children with dyscalculia have significant difference compared to the normal children.

In a research studying the executive functions of children and its relation with reasoning, reading and mathematics, this conclusion was achieved that updating and revising the daily program have a significant correlation with reading and mathematics and non-verbal reasoning and also the change has a significant correlation with non-verbal reasoning and reading (Solis, Jung & Ledge 2006, Quoted by Janeh et al., 2011).

In a comprehensive study Masterson and Evans (2008) studied the damaged functions of children having learning disorders. They believe that most of children having learning disorders show different degrees of weakness in one or more features. These features include: Audio and visual impairment, deficits in verbal expression, memory impairment, reasoning, processing and organizing.

In a research about the mathematic qualities in children having different kinds of learning problems in math performance, Andersson (2008) examined 128 3<sup>rd</sup> and 4<sup>th</sup> grade kids in mathematics field. This study provides some evidences about the fact that recovery deficits are one of the main features of children having dyscalculia. Children with dyscalculia have main issues in solving problems. The general conclusion is that it is possible that weakness in ability to respond to the math story problems in these students is due to the weakness in ability of their concrete-abstract reasoning, and it is better to firstly try to increase their ability of reasoning instead of offering them several math problems because to some extent these students have the ability of calculating figures and performing four basic math actions, but they do not have the ability to understand that which of these 4 basic math actions should be used in each of the problems, and naturally this issue is related to their weakness in the abstract reasoning ability.

It is recommended to practice detecting methods of fundamental causes of weakness and disorder in learning mathematics in elementary students and methods of enhancing memories in children, especially the visual memory and methods of enhancing the ability of reasoning in children, especially in mathematics during the in-service trainings of elementary school teachers.

Also the authorities and experts of education and training should cooperate with the experts in order to design rich learning environments along with games for educational purposes in a way that children could benefit from maximum use in order to improve and enhance the educational requirements of mathematics such as visual memory and reasoning.

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